

STATINTL

March 15, 1961

Dear Chris:

Enclosed are specifications and photographs of a highly modified version of the [] Type 829A Comparator. Two of these comparators were recently delivered to the Physical Science Laboratory of the [] This group does a great deal of the data reduction for the White Sands Missile Range.

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It is quite possible that your requirements are not identical but it serves to show how versatile the [] Type 829A Comparator can be in film sizes of 5 1/2", 70mm or even smaller.

Particularly for fast, precise measurements of distances on 70mm formats at the lowest possible cost we feel it is unequalled. Still for heavy workloads it can be fully digitized which will make it a production instrument.

For the comparator shown with a 5 1/2" self contained film stage, full rotating 70mm film stage, rotating projection screen graduated to .1 degree and special table, we quote [] Delivery 90 days after receipt of order at [] Terms 1/2 of 1% 10 days, net 30 days. Quote firm for 45 days.

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The X and Y precision screw motions can be digitized but this quotation does not include the digitizing system or the heads.

We are working with a nationally known company now in an effort to come up with our own digitizing package. We have put heavy stress on the importance of reliability and believe shortly we may have a solid state system at the same or lower cost than any other of which we are currently aware.

DECLASS REVIEW by NIMA/DOD

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March 16, 1961

We will be attending the ASP show in Washington on the 20th, 21st and 22nd of March. We will not have a booth this year but will be staying at the Shoreham and will contact you during the meeting. I will have a copy of this material with me so we can discuss it in more detail.

Very truly yours,

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BWW:ahr
Encls.

AIR MAIL

TYPE 829A FILM READER**1. GENERAL**

- 1.1 Film Reader is to provide means for making precise coordinate and angular measurements on photographic film.
- 1.2 Film Reader is to consist essentially of an assembly of mechanical stages employing precision lead screws and ways giving a longitudinal stage movement of at least 150mm and cross stage movement of at least 100mm perpendicular to the motion of the longitudinal stage, a means for holding the film for measurement, a precision rotating screen with 360 degrees of motion, a light source, necessary dials and reading optics.
- 1.3 Design and materials used are to be in accordance with the best engineering practices consistent with precision instrument manufacture.

2. SPECIFIC

- 2.1 The base is to be a single casting, designed for lightness, strength and dimensional stability and have the longitudinal ways in its upper surface.
- 2.2 The cross stage ways are to be integral with the longitudinal stage and provide cross travel at right angles to the longitudinal motion to within plus or minus 10 seconds of arc.
- 2.3 The precision lead screw furnishing the longitudinal motion shall have a pitch and lead of one millimeter. The precision lead screw furnishing the cross motion shall have a pitch and lead of one half millimeter.
- 2.4 The longitudinal precision lead screw shall have a suitable hand wheel drive on its right hand end. The cross precision lead screw shall have a similar hand wheel drive on the end towards the operator. Both screws shall have dials and indices located at the same end as the hand wheel by which stage position within each turn may be read directly to .001mm (one micron).
- 2.5 Means shall be provided to determine the turns of each precision screw such that the combination of the screw turns count and the dial reading gives the cartesian coordinate position of the point being observed in millimeters.
- 2.6 The reading optics shall be the front surface type of projection system.

The projection system shall consist of a low voltage high intensity light source mounted external to the base. It shall incorporate heat absorbing glass to reduce temperature rise at the film or plate to a minimum. A special light source power supply shall be furnished with continuously

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variable intensity control, LOW-BRIGHT switch to lengthen bulb life when not measuring and a chance to add a foot switch if desired.

The projection system shall be of the front surface type where the image is picked up by a 20X lens system and by means of a prism reflected on a white screen from the same side as viewed by the operator. The screen shall be 6"x6" enclosed with a hood so as to be used in nearly normal room light. The reticle is on the screen material so arranged that it can be either light or dark lines dependent upon the amount of light to the rear of the instrument.

The lens tube shall be 20X but so arranged that lens tubes of other powers may be substituted without modification of the projection system.

Focussing to be done by manually sliding the lens tube lengthwise in its mount. The whole to be attractively finished to match the finish of the ☐ Comparator.

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- 2.7 The screen of the projection system will be so arranged that it can be rotated through 360°. Position shall be read by a circle and vernier system that can be observed from the operator's position reading to .05 degree. In addition, provision will be made to adapt a 1000 count shaft digitizer without further modification such that one count would equal .05° rotation of the screen.
- 2.8 Two film stages will be provided. The first will accommodate 70mm film on spools 70mm diameter and expose a frame of 3 3/4" diagonal. A glass pressure plate to flatten and hold film during measurement shall be so arranged that pressure may be relieved manually during film transport and film inserted or removed without rewinding.

The entire film stage shall be capable of rotation through 360° and the film stage shall be provided with a 360° circle graduated in degrees and two indices located 180° apart.

The second film stage will hold 50 foot spools of 5 1/2" film and expose a 4"x6 1/2" area for measurement at one time. It will have a glass pressure plate and provision for loading or unloading film without rewinding. It will not rotate.
- 2.9 The cross stage shall have a pivoting plate as the top element such that an entire film stage may be rotated by a tangent screw and pivot type slow motion through ±1 degree to bring fiducial marks parallel to the motion of the stages along the ways.
- 2.10 Adaptors will be furnished to mount 1000 count pulse type digitizing heads so the precision screws may be digitized without further modification.

- 2.11 A 150mm scale on glass with lines every millimeter, numbered every 50 millimeters and of ± 2.5 micron accuracy shall be provided complete with wooden case.
- 2.12 A steel desk 24"x36" and 26" high shall be provided as a proper support and working area for the comparator.

3. ACCURACY

- 3.1 Exclusive of the quality of the image being read and human error, the overall accuracy of the instrument is to be as follows:

The actual stage position at any point within its range of travel shall not deviate from the position indicated by the reading dials by more than .001mm or .001% of the travel, whichever is greater.

- 3.2 The rotating screen motion shall be accurate to the nearest .05 degree.
- 3.3 The instrument shall be calibrated at 68°F.